

2.0 MECHANICAL/ELECTRICAL DESCRIPTION

This section describes the mechanical and electrical characteristics of the Remote I/O module, Remote I/O Head, Remote Drive Interface Head, and the Shark Interface module.

2.1 Mechanical Description

This section describes the faceplates, connectors, indicators, and switches of the Remote I/O module, Remote I/O Head, Remote Drive Interface Head, and the Shark Interface module.

2.1.1 Remote I/O Module (M/N 57C416)

The Remote I/O module is a printed circuit assembly that plugs into the backplane of the DCS 5000/AutoMax Rack. The module consists of a printed circuit board, faceplate, and protective enclosure. The faceplate contains ejector tabs at the top and bottom to simplify removing the module from the rack. See figure 2.1 for an illustration of the module faceplate.

The 25-pin D-shell connector on the faceplate supports the RS-232 compatible serial port described in section 5.0. The 9-pin D-shell connector on the faceplate is used to connect the module to the network.

The two thumbwheel switches on the faceplate are used to set the remote I/O network drop number. The upper thumbwheel switch represents the most significant digit; the lower thumbwheel switch represents the least significant digit. The thumbwheel switches are read only on power-up. If it is necessary to change the drop number, you must change the setting and then cycle power. On the back of the module are two edge connectors that attach to the system backplane.

For diagnostic purposes, the faceplate contains a seven-segment LED that displays error codes. The error codes are defined in Appendix D. A green status LED on the faceplate indicates when the module is operational (ON) or should be replaced (OFF).

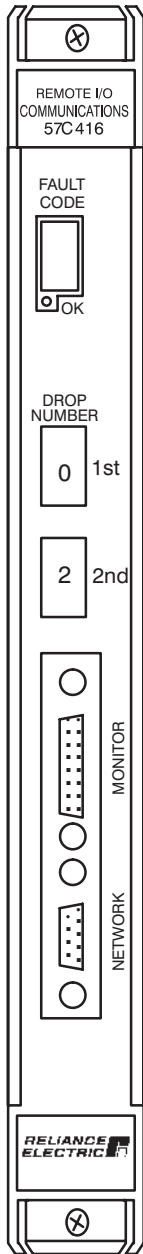


Figure 2.1 - Remote I/O Module Faceplate

2.1.2 Shark Interface Module (M/N 57C554)

The Shark Interface module is a printed circuit board assembly that plugs into the backplane of a Shark rack in the first slot to the right of the power supply.

It consists of a printed circuit board and a faceplate. The faceplate contains tabs at the top and bottom to simplify removing the module from the rack. On the back of the module are two connectors that attach to the system backplane. Module dimensions are given in Appendix A.

The faceplate of the module contains one 9-pin female D-shell connector labeled "NETWORK." See figure 2.2. This connector allows the module to connect to the Remote I/O network.

The module faceplate contains two green status LEDs. When lit, the top LED, labeled "CPU OK," indicates that the module has passed its power-up diagnostics and is operating properly. When lit, the bottom LED, labeled "COM OK," indicates that the module is communicating on the Remote I/O network. When the LED is flashing, it indicates that an invalid drop number has been selected on the rotary switch, which is described below .

The 16-position rotary switch is used to select the Shark rack's Remote I/O drop number (1 to 7 or 9 to F). This switch is read only on power-up. If it is necessary to change the rack's drop number, you must change the setting of the rotary switch and then cycle power.

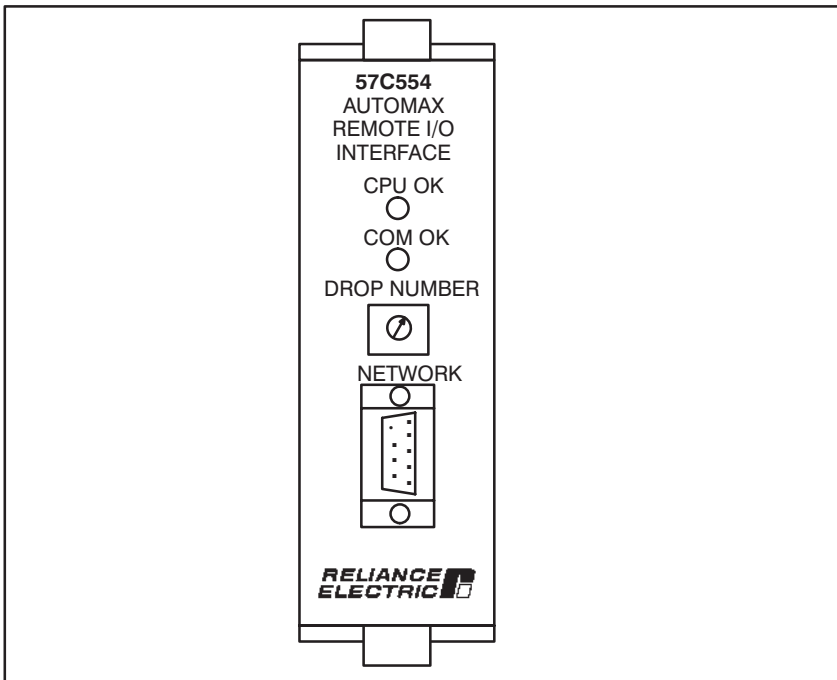


Figure 2.2 - AutoMax Remote I/O Shark Interface Module Faceplate

2.1.3 Remote I/O Head (M/N 57C328)

The Remote I/O Head can be used as an interface between the AutoMax Remote I/O network and the AutoMate rail I/O system, which consists of Local Heads, digital or analog rails, LED modules, or Thumbwheel Switch Modules. Note that although the Remote I/O Head can be used as an interface to drives with rail-type interface ports (such as the Reliance GP-2000/VTAC V controller), it is recommended that **only** the Remote Drive Interface Head (M/N 57C329) be used for interfacing with drives over an AutoMax Remote I/O network. See section 2.1.5 for more information.

The M/N 57C328 Remote I/O Head is identical to the M/N 57C330 Remote I/O Head, except that you can mix input and outputs in the same rail. Each port on the Remote I/O head contains separate address spaces for inputs and outputs. Like the M/N 57C330 Remote I/O Head, it can control up to 4 digital rails, analog I/O rails, or Local Heads. Each Local Head can in turn control up to 4 AutoMate digital rails. Therefore, a Remote I/O Head with 4 Local Heads connected to it can control a maximum 16 digital rails.

The AutoMax Remote I/O Head consists of a power supply, two printed circuit boards (a processor board and a remote I/O communications board), a faceplate, and a protective metal enclosure. See figure 2.3 for an illustration of the both Remote I/O Heads.

The 25-pin D-shell connector on the faceplate supports the RS-232-compatible serial port described in section 5.0. The BNC connector on the faceplate is used to connect the Remote I/O Head to the Remote I/O network. The four I/O connectors are used for Rail and/or Local Head communications.

The thumbwheel switch on the faceplate is used to set the Remote I/O network drop number. Drop numbers 1 through 7 inclusive indicate valid Remote I/O drop numbers.

The terminal strip on the faceplate provides connections for incoming power as well as a set of normally open contacts from the Ready Relay. The contacts are closed when the Remote I/O Head is operating properly and open if a problem is detected in the on-board microprocessor. These contacts can be used to take remedial action in the event of a problem with the on-board microprocessor.

For diagnostic purposes, the faceplate contains a seven-segment LED that displays error codes (see Appendix D). The faceplate also contains six status LEDs, which are labeled as follows:

RUN (amber): Normally on; if off, indicates that the CPU watchdog has timed out.

POWER (green): When on, indicates power is being supplied to the CPU and internal voltages are within range.

CPU READY (amber): Will turn on after the power-up diagnostics have been completed successfully and the CPU watchdog has not timed out. Also indicates the state of the Ready Relay contacts. When on, the Ready Relay contacts are closed.

FAULT MSB/FAULT LSB (amber): Normally off. When on, these LEDs indicate the particular rail that has experienced a fault. These LEDs are valid while the Rail Fault LED is lit. See section 6.8 for more information.

RAIL FAULT (red): When on, indicates that a rail fault has occurred.

Note that during power-up diagnostics, the bottom four LEDs (CPU, READY, FAULT MSB, FAULT LSB, and RAIL FAULT) will stay on long enough to allow verification that they will light.

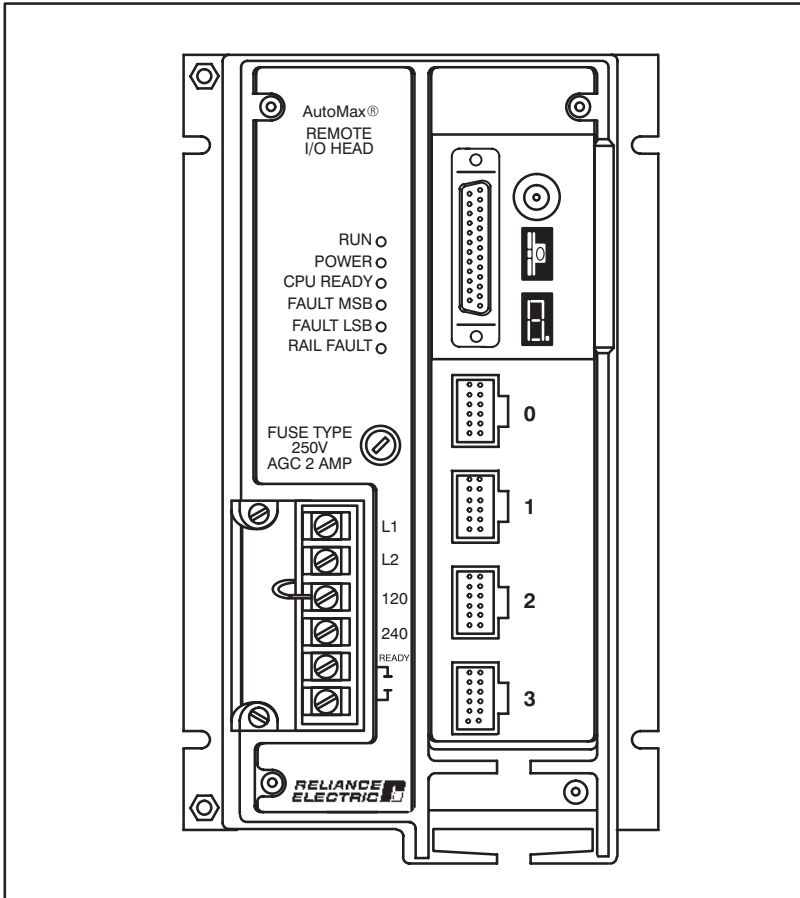


Figure 2.3 - AutoMax Remote I/O Head Faceplate (M/N 57C328 and M/N 57330)

2.1.4 Remote I/O Head (M/N 57C330)

The Remote I/O Head can be used as an interface between the AutoMax Remote I/O network and the AutoMate rail I/O system, which consists of Local Heads, digital or analog rails, LED modules, or Thumbwheel Switch modules. Note that although the Remote I/O Head can be used as an interface to drives with rail-type interface ports (such as the Reliance® GP-2000/VTAC V controller), it is recommended that only the Remote Drive Interface Head (M/N 57C329) be used for interfacing with drives over an AutoMax Remote I/O network. See section 2.1.5 for more information.

The Remote I/O Head can control up to 4 digital rails, analog I/O rails, or Local Heads. Each Local Head can in turn control up to 4 AutoMate digital rails. Therefore, a Remote I/O Head with 4 Local Heads connected to it can control a maximum of 16 digital rails. The digital rails must be all inputs or all outputs.

The AutoMax Remote I/O Head consists of a power supply, two printed circuit boards (a processor board and a remote I/O communications board), a faceplate, and a protective metal enclosure. See figure 2.3 for an illustration of the Remote I/O Head.

The 25-pin D-shell connector on the faceplate supports the RS-232-compatible serial port described in section 5.0. The BNC connector on the faceplate is used to connect the Remote Head to the Remote I/O network. The four I/O connectors are used for Rail and/or Local Head communications.

The thumbwheel switch on the faceplate is used to set the Remote I/O network drop number. Drop numbers 1 through 7 inclusive indicate valid Remote I/O drop numbers.

The terminal strip on the faceplate provides connections for incoming power as well as a set of normally open contacts from the Ready Relay. The contacts are closed when the Remote I/O Head is operating properly and open if a problem is detected in the on-board microprocessor. These contacts can be used to take remedial action in the event of a problem with the on-board microprocessor.

For diagnostic purposes, the faceplate contains a seven-segment LED that displays error codes (see Appendix D). The faceplate also contains six status LEDs, which are labeled as follows:

RUN (amber): Normally on; if off, indicates that the CPU watchdog has timed out.

POWER (green): When on, indicates power is being supplied to the CPU and internal voltages are within range.

CPU READY (amber): Will turn on after the power-up diagnostics have been completed successfully and the CPU watchdog has not timed out. Also indicates the state of the Ready Relay contacts. When on, the Ready Relay contacts are closed.

FAULT MSB / FAULT LSB (amber): Normally off. When on, these LEDs indicate the particular rail that has experienced a fault. These LEDs are valid while the Rail Fault LED is lit. See section 6.8 for more information.

RAIL FAULT (red): When on, indicates that a rail fault has occurred.

Note that during power-up diagnostics, the bottom four LEDs (CPU READY, FAULT MSB, FAULT LSB, and RAIL FAULT) will stay on long enough to allow verification that they will light.

2.1.5 Remote Drive Interface Head (M/N 57C329)

The Remote Drive Interface Head can be used only as an interface between the AutoMax Remote I/O network and drives with rail-type interface ports (such as the Reliance V★S GP-2000/VTAC V controller). **This Head must not be connected to Local Heads (M/N 61C22), Digital Rails (M/N 45C1), Analog Rails (various model numbers), LED modules (M/N 45C631), or Thumbwheel Switch modules (M/N 45C630).**

The Remote Drive Interface Head consists of a power supply, two printed circuit boards (a processor board and a remote I/O communications board), a faceplate, and a protective metal enclosure. See figure 2.4 for an illustration of the Remote Drive Interface Head.

The 25-pin D-shell connector on the faceplate supports the RS-232-compatible serial port described in section 5.0. The BNC connector on the faceplate is used to connect the Remote Drive Interface Head to the Remote I/O network. The four I/O connectors are used only to connect to drives with rail-type interface ports (e.g., the Reliance V★S GP-2000/VTAC V controller with a Rail Interface module (1SC4000)) via the interface cable (M/N 45C8) supplied with the Rail Interface module.

The thumbwheel switch on the faceplate is used to set the Remote I/O network drop number. Drop numbers 1 through 7 inclusive indicate valid Remote I/O drop numbers.

The terminal strip on the faceplate provides connections for incoming power as well as a set of normally open contacts from the Ready Relay. The contacts are closed when the Remote Drive Interface Head is operating properly and open if a problem is detected in the on-board microprocessor. These contacts can be used to take remedial action in the event of a problem with the on-board microprocessor.

For diagnostic purposes, the faceplate contains a seven-segment LED that displays error codes (see Appendix D). The faceplate also contains three status LEDs, which are labeled as follows:

RUN (amber): Normally on; if off, indicates that the CPU watchdog has timed out.

POWER (green): When on, indicates power is being supplied to the CPU and internal voltages are within range.

CPU READY (amber): Will turn on after the power-up diagnostics have been completed successfully and the CPU watchdog has not timed out. Also indicates the state of the Ready Relay contacts. When on, the Ready Relay contacts are closed.

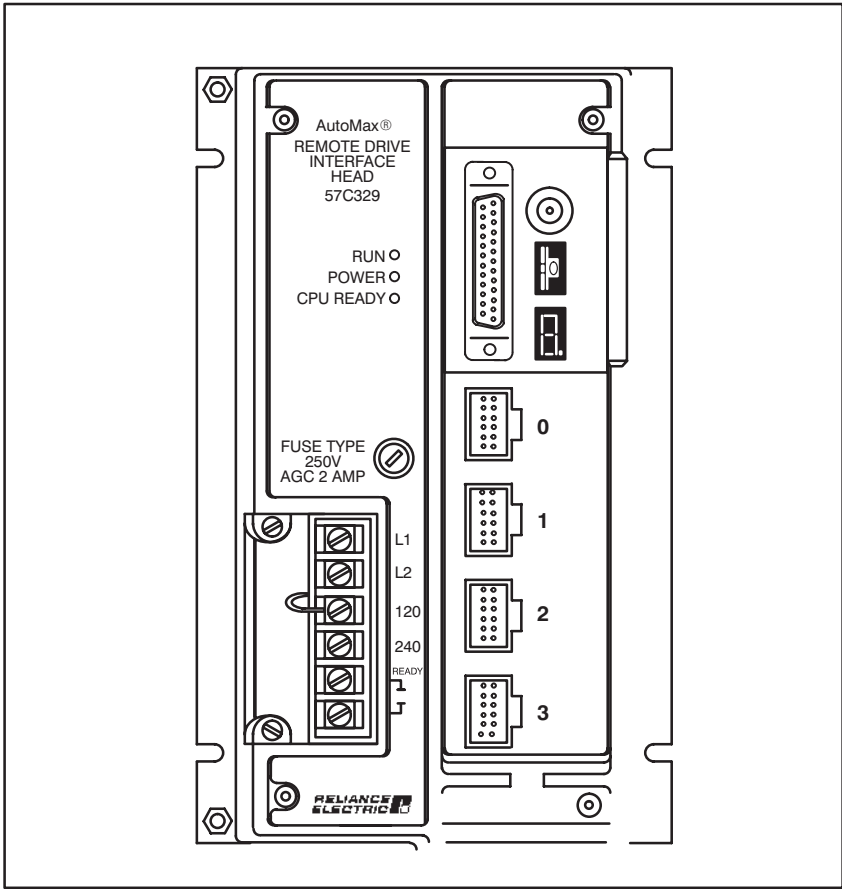


Figure 2.4 - AutoMax Remote Drive Interface Head Faceplate

2.2 Electrical Description

This section describes the electrical characteristics of the Remote I/O module, the Shark Interface module, the AutoMax Remote I/O Head, and the AutoMax Remote Drive Interface Head.

2.2.1 Remote I/O Module (M/N 57C416)

The Remote I/O module contains a microprocessor that connects to one port of the dual port memory while the other port interfaces with the Multibus backplane. A block diagram is shown in Appendix B.

The module contains a watchdog timer, which is enabled when power is turned on to the module. The on-board microprocessor must reset the watchdog timer within a specified time or the microprocessor will shut down and the OK LED on the faceplate will turn off.

At power up, the on-board processor will run diagnostics on the microprocessor, EPROM, RAM, serial I/O, memory management unit, and dual port memory, as well as perform system-level diagnostics. As each test is run, a number is written out to the seven-segment display. If there is a fault during the diagnostics, the microprocessor will halt, the watchdog will time out, and the seven-segment display will show the code of the failed diagnostic.

2.2.2 Shark Interface Module (M/N 57C554)

The Shark Interface module contains a microprocessor that interfaces to the Shark rack's backplane through timing and buffer circuitry.

Power for the module's logic circuitry is supplied by the rack's +5 VDC power supply. Power for the module's remote I/O network driver is supplied by the rack's +24 VDC power supply and is regulated at +12 VDC.

2.2.3 Remote I/O Head (M/N 57C328)

The remote I/O Head has an on-board power supply that provides all voltages necessary to power the Remote I/O Head and the I/O system. The power supply has an input voltage of 120/240 VAC.

The Remote I/O Head contains a microprocessor that connects to the four I/O ports via the I/O interface circuitry. At power up, the Head polls the rail sub-system to determine how many rails are connected to it. Each port on the Remote I/O Head is treated like a Multibus slot and can contain from 0-4 rails. Each rail is mapped to one input register and one output register in the dual port memory of the M/N 57C416, which allows you to mix digital inputs and outputs in the same rail. The location of the rail's registers is fixed in the dual port memory of M/N 57C416. See Appendix I for more information about the Remote I/O Head's memory map.

The Remote I/O Head connects to the Remote I/O network through one channel of a serial I/O device. The second channel of the serial I/O device provided a monitor port for the user. A block diagram is shown in Appendix B.

The Remote I/O Head contains a watchdog timer that is enabled when power is turned on to the Head. The microprocessor must reset the watchdog timer within a specified time or the microprocessor will shut down and the RUN and CPU READY LEDs on the faceplate will turn off.

A set of normally open contacts from the Ready Relay are provided on the terminal strip. The contacts open whenever a problem is detected in the on-board microprocessor. These contacts should be used in an E-stop (emergency stop) circuit to remove power from the outputs in case of emergency. See section 3.5.5 for more information.

At power up, the on-board microprocessor will run diagnostics on the microprocessor, EPROM, RAM, serial I/O, and the I/O interface, as well as perform system-level diagnostics. As each test is run, a number is written out to the seven-segment display. If there is a fault during the diagnostics, the microprocessor will halt, the watchdog will time out, and the seven-segment display will show the code of the failed diagnostics.

2.2.4 Remote I/O Head (M/N 57C330)

The Remote I/O Head has an on-board power supply that provides all voltages necessary to power the Remote I/O Head and the I/O system. The power supply has an input voltage of 120/240 VAC.

The Remote I/O Head contains a microprocessor that connects to the four I/O ports via the I/O interface circuitry. It connects to the Remote I/O network through one channel of a serial I/O device. The second channel of the serial I/O device provides a monitor port for the user. A block diagram is shown in Appendix B.

The Remote I/O Head contains a watchdog timer that is enabled when power is turned on to the Head. The microprocessor must reset the watchdog timer within a specified time or the microprocessor will shut down and the RUN and CPU READY LEDs on the faceplate will turn off.

A set of normally open contacts from the Ready Relay are provided on the terminal strip. The contacts open whenever a problem is detected in the on-board microprocessor. These contacts should be used in an E-stop (emergency stop) circuit to remove power from the outputs in case of emergency. See section 3.5.5 for more information.

At power up, the on-board microprocessor will run diagnostics on the microprocessor, EPROM, RAM, serial I/O, and the I/O interface, as well as perform system-level diagnostics. As each test is run, a number is written out to the seven-segment display. If there is a fault during the diagnostics, the microprocessor will halt, the watchdog will time out, and the seven-segment display will show the code of the failed diagnostic.

2.2.5 Remote Drive Interface Head (M/N 57C329)

The Remote Drive Interface Head has an on-board power supply that provides all voltages necessary to power the Remote Drive Interface Head and to communicate with up to four drives. The power supply has an input voltage of 120/240 VAC.

The Remote Drive Interface Head contains a microprocessor that connects to the four I/O ports via the I/O interface circuitry. It connects to the Remote I/O network through one channel of a serial I/O device. The second channel of the serial I/O device provides a monitor port for the user. A block diagram is shown in Appendix B.

The Remote Drive Interface Head contains a watchdog timer that is enabled when power is turned on to the Head. The microprocessor must reset the watchdog timer within a specified time or the microprocessor will shut down and the RUN and CPU READY LEDs on the faceplate will turn off.

A set of normally open contacts from the Ready Relay are provided on the terminal strip. The contacts open whenever a problem is detected in the on-board microprocessor. These contacts should be used in an E-stop (emergency stop) circuit to remove power from the outputs in case of emergency. See section 3.5.5 for more information.

At power up, the on-board microprocessor will run diagnostics on the microprocessor, EPROM, RAM, serial I/O, and the I/O Interface, as well as perform system-level diagnostics. As each test is run, a number is written out to the seven-segment display. If there is a fault during the diagnostics, the microprocessor will halt, the watchdog will time out, and the seven-segment display will show the code of the failed diagnostic.

2.3 Drop Numbers

Drop numbers are used to uniquely identify every rack on the Remote I/O network; therefore, a drop and a rack are the same entity on a Remote I/O network. There are a maximum of seven slave drops on a Remote I/O network, each identified by the rotary switch (Shark) or thumbwheel switches (Remote I/O module, Remote Drive Interface Head, and Remote I/O Heads) on the faceplate. For Remote I/O modules drop numbers 0 through 7 are valid, with drop 0 always being reserved for the master Remote I/O module. For all Remote Heads, only drop numbers 1 through 7 are valid.

For Shark racks, which can only be slave drops, the drop number setting should be selected based upon the I/O module complement in the rack. A rack containing digital modules only should be set to drop numbers 9 through F. This allows faster network throughput. Note that drop numbers 1 through 7 will also work for racks containing only digital modules; however, the total network throughput will be slower with this setting. See section 4.5 for information on network throughput.

A Shark rack containing mixed digital and analog (numeric) or all analog modules must be set to drop numbers 1 through 7. No other drop numbers are valid. In addition, you must also write a configuration word in the AutoMax application program as described in section 4.6.1. See figure 2.5 for valid drop number settings.

Drop #	Multibus Drop	Remote Head Drop	Shark Drop (all digital)	Shark Drop (mixed digital and analog or all analog)
0	OK (master)	X	X	X
1	OK	OK	OK*	OK
2	OK	OK	OK*	OK
3	OK	OK	OK*	OK
4	OK	OK	OK*	OK
5	OK	OK	OK*	OK
6	OK	OK	OK*	OK
7	OK	OK	OK*	OK
9	N/A	N/A	OK	X
A	N/A	N/A	OK	X
B	N/A	N/A	OK	X
C	N/A	N/A	OK	X
D	N/A	N/A	OK	X
E	N/A	N/A	OK	X
F	N/A	N/A	OK	X

OK = valid setting
 OK* = valid setting, but will result in lower throughput
 X = not a valid setting
 N/A = not applicable, i.e., the setting is unavailable

Note: If you are using settings 9 through F on any drop on the remote I/O network, see figure 2.6 for more information

Figure 2.5 - Remote I/O Network Drop Numbers

Note that drop numbers 1 through 7 and 9 through F are interpreted as being equivalent. In other words, you can assign a drop number of 1 or 9 on a network, but not both; you can assign a drop number of 2 or A, but not both, etc. See figure 2.6 for mutually exclusive drop number settings.

Mutually Exclusive Drop Numbers	
0	(none)
1	9
2	A
3	B
4	C
5	D
6	E
7	F

Figure 2.6 - Mutually Exclusive Drop Numbers

2.4 Remote I/O Drop Hardware

This manual provides information on the Remote I/O module, the Shark Interface module, the Remote I/O Heads, and the Remote Drive Interface Head.

For additional information regarding Shark I/O modules and racks, please refer to the Shark XL I/O System instruction manual, J2-3018.

For additional information on AutoMate Digital I/O and Rails, please refer to instruction manual J-3012.

For additional information on AutoMate Local I/O Heads, please refer to instruction manual J-3671.

For additional information about the Rail Interface module and the V★S GP2000/VTAC V controller, refer to instruction manual D2-3170.